IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Patent application of:

Applicant(s):	James Robert Durrant et al.
Serial No:	10/520,608
Filing Date:	January 3, 2006
Title:	OXYGEN-SCAVENGING PACKAGING
Examiner:	Marc A. Patterson
Art Unit:	1794
Docket No.	FRYHP0127US

APPEAL BRIEF

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

The undersigned submits this brief for the Board's consideration of the appeal of the Examiner's decision, mailed June 24, 2009, finally rejecting claims 1-34 of the above-identified application.

The fee for filing an appeal brief is being paid herewith. In the event an additional fee or further extension of time is necessary, the Commissioner is authorized to charge any additional fee which may be required, and further to consider this a petition for an extension of time to make the filing of this brief timely, to Deposit Account No. 18-0988 under Docket No. FRYHP0127US.

I. Real Party in Interest

The real parties in interest in the present appeal are Imperial College Innovations Limited and University of Strathclyde.

II. Related Appeals and Interferences

Neither appellant, appellant’s legal representative, nor the prior assignee of the present application are aware of any appeals or interferences which will directly affect, which will be directly affected by, or which will have a bearing on the Board's decision in the pending appeal.

III. Status of Claims

Claims 1-34 have been finally rejected and claim 35 has been withdrawn from consideration. The claims on appeal are claims 1-34 and a correct copy of these claims is reproduced in the Claims Appendix.

IV. Status of Amendments

No claim amendments were filed subsequent to the issuance of the final Office Action, from which this appeal is taken.

V. Summary of Claimed Subject Matter

The following is a concise explanation of the subject matter defined in each of the independent claims involved in the appeal, which refers to the specification by page and line number in brackets, and to the drawings by reference characters.

Claim 1

1. A package (1, 11, 21, 31, 41, 51) packaging (4, 14, 24, 34, 44, 54) an item (3, 13, 23, 33, 43, 53) and defining a closed environment in which the item (3, 13, 23, 33, 43, 53) is enclosed [6/10-13], the packaging including an oxygen-scavenging element (6, 16, 26, 36, 46, 56) which includes a photo-activatable semiconductor [2/29-31; 5/31-32] and an electron donor [4/1], wherein the semiconductor, whilst exposed to ultra-bandgap light, generates electron-hole pairs [1/8-12; 6/1], with the electrons acting to reduce oxygen, and thereby scavenge the same from the closed environment [1/13 and 14; 1/22-26], and the holes combining with electrons sacrificed by the electron donor [1/14 and 15; 1/18-20].

VI. Grounds of Objection/Rejection to Be Reviewed on Appeal

A. Claims 1-7, 9-16, 18-29 and 34 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,387,461 (herein referred to as "Ebner").

B. Claims 17 and 30-33 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ebner.

C. Claim 8 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Ebner in view of U.S. Patent No. 2,877,197 (herein referred to as "Fisher").

VII. Argument

The rejections advanced by the Examiner are improper and should be reversed for at least the following reasons.

Summary

The present application is directed toward an oxygen scavenging element for de-oxygenating a closed-environment of a packaging simply by exposing the oxygen scavenging element to ultra-bandgap light. The use of packaging having a de-oxygenated environment is necessary in various packaging applications, including, for example, the packaging of electronic and opto-electronic devices, foodstuffs, pharmaceuticals, artifacts, artwork, metals, medical instruments, and other articles that are subject to oxidative deterioration in an environment in which oxygen is present.

Conventional methods of reducing oxygen in such packaging applications include the use of oxygen barrier layers on the packaged item, packaging the item in low-oxygen environments (i.e., modified atmosphere packaging (MAP)), flushing the packaging with carbon dioxide or nitrogen, and the use of sachets of oxygen scavengers (e.g., ascorbic acid or finely-divided iron). But disadvantages associated with such conventional methods include, for example, the requirement to package the item in a special environment and the inability to control the oxygen scavenging process.

Unlike the aforementioned conventional de-oxygenation methods, the packaging of the present disclosure allows packaging to be performed in the absence of a special packaging environment, provides for greater controllability of the oxygen scavenging

process, and enables the oxygen scavenging element to remain functional for a longer period of time.

The exemplary package 1 illustrated in Fig. 1 (reproduced below), comprises packaging 4 that packages an item 3 and defines a closed environment in which the item 3 is enclosed.

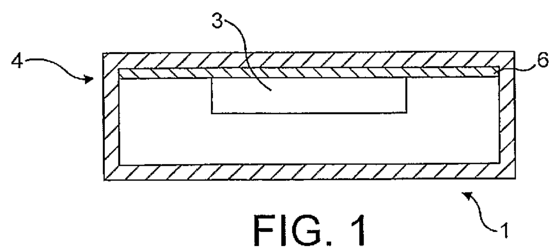

FIG. 1

The packaging 4 includes an oxygen-scavenging element 6 which includes a photo-activatable semiconductor and an electron donor. When the oxygen-scavenging element 6 is exposed to ultra-bandgap light, electron-hole pairs are generated, with electrons acting to reduce oxygen and thereby scavenge the oxygen from the closed environment. The holes are combined with electrons sacrificed by the electron donor.

A. Rejection of claims 1-7, 9-16, 18-29 and 34 under 35 U.S.C. § 102(b)

Claims 1-7, 9-16, 18-29 and 34 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Ebner.

The Examiner's remarks in support of the rejection are as follows:

> With regard to Claims 1-4, 11, 14-15, and 29, Ebner et al disclose a package packaging an item and defining a closed environment in which the item is enclosed (column 3, lines 50-52), the packaging including an oxygen-scavenging element which includes titanium oxide (column 4, lines 40-60), therefore a photo-activatable semiconductor and polyvinyl chloride (column 8, lines 56-57), therefore an electron donor that is an organic material; Ebner et al therefore also include a semiconconductor that whilst exposed to ultra-bandgap light generates electron-hole pairs, with the electrons acting to reduce oxygen, thereby to scavenge the same from the

closed environment, and the holes combining with electrons sacrificed by the electron donor.

Office Action dated June 24, 2009, page 2.

Reversal of the rejection is respectfully requested for at least the following reasons.

Claim 1

Claim 1 recites packaging including, *inter alia*, an oxygen-scavenging element which includes a photo-activatable semiconductor. The Examiner contends that such feature is taught by Ebner, and in support of his contention, recites that Ebner discloses "packaging including an oxygen-scavenging element which includes titanium oxide (column 4, lines 40-60)." Appellants respectfully submit that the Examiner's contention is incorrect. As set forth in detail below, Ebner only discloses the use of titanium as a transition metal, and does not teach or suggest the use of titanium dioxide (TiO_2) as an inorganic transition metal salt.

Ebner is directed to a moisture-activated oxygen-scavenging combination that comprises at least one hydroxosulfitometalate (HSM) in combination with at least one transition metal ion source. (see, e.g., Ebner, Col. 3, lines 31-35.) The HSM oxygen scavenging agent is used in combination with small amounts of transition metal ions to provide oxygen scavenging activity when the agent is placed in the presence of oxygen and moisture. (Ebner, column 4, lines 28-32; column 6, lines 63-67.)

Hence, in Ebner, the combination of oxygen-scavenging HSM and transition metal ions are used in conjunction with moisture to scavenge oxygen. The transition

metal ions may be provided, for example, by specific transition metals. Ebner discloses these specific transition metals in the following recitation:

> The transition metals found useful herein are those of the series of metals of the Periodic Table in which the filling of the outermost shell to eight electrons is interrupted to bring the penultimate shell from 8 to 12 or 32 electrons. These elements use both their penultimate shell orbits as well as outermost shell orbits in bonding. Thus, the transition elements include elements of the first transition series of the Periodic Table composed of elements 21 through 29 (Sc, Ti, V, Cr, Mn, Fe, Co, Ni and Cu or mixtures thereof) and, of these, the preferred metals are cobalt, copper, iron, tin, nickel and manganese or mixtures thereof with copper and cobalt being most preferred.

(column 4, lines 46-57.) Titanium is identified in Ebner as a suitable transition metal.

Ebner also discloses that the transition metal ions may be provided by specific transition metal salts. Specifically, with regard to the inorganic metal salts, Ebner recites:

> Examples of such salts include Copper (I or II) sulfide, Copper (I or II) bromide, Copper (I or II) chloride, Copper (I or II) oxide, Copper (II) carbonate, Copper (II) fluoride, Copper (II) hydroxide, Copper (I or II) iodide, Copper (II) nitrate, Copper (II) nitrite, Copper (II) sulfate, Cobalt (II) bromide, Cobalt (II) carbonate, Cobalt (II) choride, Cobalt (II) hydroxide, Cobalt (II) nitrate, Cobalt (II) sulfate, Cobalt (II or III) oxide, Iron (II or III) bromide, Iron (II or III) chloride, Iron (II or III) fluoride, Iron (III) nitrate, Iron (II or III) oxide, Iron (II or III) perchlorate, Iron (III) phosphate, Iron (II or III) sulfate, Iron (II) sulfide, Manganese (II) bromide, Manganese (II) carbonate, Manganese (II) chloride, Manganese (II, III or IV) oxide, Manganese (II) hypophosphite, Manganese (II) nitrate, Manganese (II) sulfate, Nickel (II) bromide, Nickel (II) chloride, Nickel (II) hyrdoxide, Nickel (II) oxide. The preferred inorganic salts useful in forming the present oxygen scavenger system and composition are copper (II) sulfate, copper (I) chloride, copper (II) chloride, cobalt (II) sulfate, iron (II) chloride, iron (III) chloride, iron (II) sulfate, manganese (II) sulfate, tin (II) sulfate and nickel (II) sulfate.

(column 5, line 56 – column 6, line 9.) TiO_2 is not identified in the list.

The Examiner is contending that Ebner discloses the positive oxidation state of titanium (i.e. TiO_2), and therefore discloses a photo-activatable semiconductor.

Contrary to the Examiner's contentions, Ebner does not disclose the positive oxidation state of titanium among those inorganic transition metal salts identified as suitable for use in the oxygen-scavenging combination.

Accordingly, Ebner does not teach or suggest the use of TiO_2 as an inorganic transition metal salt. It follows that Ebner does not teach or suggest an oxygen-scavenging element that includes a photo-activatable semiconductor, as recited in claim 1.

Claims 3 and 4

Claim 3 recites that the electron donor of claim 1 comprises an organic material comprising a polymeric material. Claim 4 further recites that the polymeric material of claim 3 comprises PVA, PVC, PEG, polyethylene oxide, hydroxyethyl cellulose, or a mixture thereof. The Examiner contends that such features are taught by Ebner, and in support of his contention, recites that Ebner discloses "polyvinyl chloride (column 8, lines 56-57), therefore an electron donor that is an organic material." Appellants respectfully submit that the Examiner's contention is incorrect. Ebner only discloses the use of polyvinyl chloride as a carrier, and does not teach or suggest that the carrier as used in the oxygen-scavenging combination of Ebner is an electron donor.

As discussed above, a suitable transition metal or transition metal salt, not the carrier, provides the transition metal ions for the oxygen-scavenging HSM of Ebner. However, the recitation of Ebner identified by the Examiner is not directed to the transition metal, but rather to the carrier. The carrier is not an electron donor for the oxygen-scavenging combination of Ebner. Rather, as recited in Ebner, the carrier performs the following:

> The primary functions served by the polymeric matrix for purposes of the present invention are to provide a compatible carrier (a material which is stable under normal packaging temperature condition sand does not deactivate the oxygen scavenger agent) for the HSM/transition metal compound combination of the present invention as described herein, permit the HSM/transition metal compound combination to be maintained under substantially anhydrous or low moisture conditions during storage, and to permit ingress of both oxygen and water into the composition under dictated conditions and in a manner which permits them to come into contact with the HSM/transition metal compound combination.

(column 8, lines 36-48.)

That is, in Ebner, the oxygen-scavenging combination is combined with a polymeric carrier that maintains the agent free from moisture prior to use in the packaging environment, and also permits the ingress of oxygen and water into the carrier while in the packaging environment, thereby permitting oxygen scavenging to occur. (Ebner, column 7, lines 3-8; column 8, lines 25-26; column 8, lines 36-48.)

As set forth above with respect to claims 3 and 4, Ebner does not teach or suggest that the carrier functions as an electron donor in the oxygen-scavenging combination of Ebner.

Accordingly Ebner does not teach or suggest that the electron donor of claim 1 comprises an organic material comprising a polymeric material, as recited in claim 3. Furthermore, Ebner does not teach or suggest that the electron donor of claim 1 comprises PVA, PVC, PEG, polyethylene oxide, hydroxyethyl cellulose, or a mixture thereof, as recited in claim 4.

<u>Claims 7 and 9</u>

For reasons consistent with the argument set forth above with respect to claims 3 and 4, Ebner fails to teach or suggest the subject matter of claims 7 and 9.

Claim 7 recites that the electron donor of claim 1 comprises an organic material comprising an alcohol. Claim 9 recites that the electron donor of claim 1 comprises an organic material comprising an aldehyde

In support of the rejection of claim 7, the Examiner identifies column 8, line 56 of Ebner, which recites:

> [S]uitable polymers from which an exemplary polymeric matrix of the present invention may be derived include polyolefins, vinyl polymers, polyethers, polyesters, polyamdes, phenol-formaldehyde condensation polymers, polysiloxanes, ionic polymers, polyurethanes, acrylics and naturally occurring polymers such as cellulosics, tannins, polysaccharides, and starches.

In support of the rejection of claim 9, the Examiner identifies column 10, line 52 of Ebner, which recites:

> [I]t is preferred that compositions having such hydrated particulate material be stored under an inert atmosphere until used.

Both recitations are generally directed toward the carrier of Ebner.

As set forth above, Ebner does not teach or suggest an oxygen-scavenging element that includes a photo-activatable semiconductor, as recited in claim 1. Also, it is not taught or suggested that the carrier functions as an electron donor in the oxygen-scavenging combination of Ebner.

Accordingly Ebner does not teach or suggest that the electron donor of claim 1 comprises an organic material comprising an alcohol, as recited in claim 7. Furthermore, Ebner does not teach or suggest that the electron donor of claim 1 comprises an organic material comprising an aldehyde, as recited in claim 7.

Claim 14

Claim 14 depends from claim 1 and recites that the photo-activatable semiconductor of claim 1 comprises an oxide semiconductor.

As set forth above in relation to claim 1, the moisture-activated oxygen-scavenging combination of Ebner does not include a photo-activatable semiconductor. Rather, Ebner merely discloses the use of titanium as a transition metal to provide transition metal ions to the oxygen-scavenging HSM. Accordingly, Ebner does not teach or suggest that the photo-activatable semiconductor comprises an oxide semiconductor, as recited in claim 14.

Claim 15

Claim 15 further recites that the photo-activatable oxide semiconductor of claim 14 comprises TiO_2.

As set forth above in relation to claim 1, Ebner merely discloses the use of titanium as a transition metal to provide transition metal ions to the oxygen-scavenging HSM. That is, Ebner does not teach or suggest the use of TiO_2 as an inorganic transition metal salt. Accordingly, Ebner does not teach or suggest that the photo-activatable oxide semiconductor comprises TiO_2, as recited in claim 15.

Claim 16

Claim 16 recites that the photo-activatable oxide semiconductor of claim 14 comprises zinc oxide (ZnO).

In support of the rejection, the Examiner identifies Column 4, lines 40-43 of Ebner, which recites:

> It has been unexpectedly found that one can obtain a highly effective oxygen scavenger by combining HSM with a transition metal compound. The transition metal compound may be in the form of a salt, chelate, complex or compound in which the transition metal is associated with other elements or groups by ionic or covalent bonds.

The recitation identified by the Examiner is merely a general statement set forth in Ebner prior to describing suitable transition metals and transition metal salts. Neither zinc nor ZnO is identified as being suitable for use in the oxygen-scavenging combination of Ebner. In fact, zinc is absent from the exclusive list of transition metals contemplated by Ebner. Specifically, Ebner recites:

> The transition metals found useful herein are those of the series of metals of the Periodic Table in which the filling of the outermost shell to eight electrons is interrupted to bring the penultimate shell from 8 to 12 or 32 electrons. These elements use both their penultimate shell orbits as well as outermost shell orbits in bonding. **Thus, the transition elements include elements of the first transition series of the Periodic Table composed of elements 21 through 29** (Sc, Ti, V, Cr, Mn, Fe, Co, Ni and Cu or mixtures thereof) and, of these, the preferred metals are cobalt, copper, iron, tin, nickel and manganese or mixtures thereof with copper and cobalt being most preferred.

(column 4, lines 46-57.) (emphasis added)

Hence, Ebner only teaches the use of transition elements (i.e. transition metals) of the first transition series of the Periodic Table composed of elements 21 through 29, of which zinc (element 30) is not included. Also, the positive oxidation state of zinc (ZnO) is not disclosed in Ebner among the inorganic transition metal salts suitable for use in the oxygen-scavenging combination. (Ebner, column 5, line 56 – column 6, line 9, reproduced above.)

Accordingly, Ebner does not teach or suggest that the photo-activatable oxide semiconductor comprises ZnO, as recited in claim 16.

Claims 18

Claim 18 recites that the photo-activatable oxide semiconductor of claim 14 comprises at least two of TiO_2, ZnO, and WO_3.

As discussed above, Ebner fails to teach or suggest that the photo-activatable oxide semiconductor comprises TiO_2 or ZnO. Also, as set forth in more detail below, Ebner fails to teach or suggest that the photo-activatable oxide semiconductor comprises WO_3.

It follows that Ebner does not teach or suggest that the photo-activatable semiconductor comprises at least two of TiO_2, ZnO, and WO_3.

B. Rejection of claims 17 and 30-33 under 35 U.S.C. § 103(a)

Claims 17 and 30-33 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ebner. Claims 17 and 30-33 depend from claim 1, and, as such, are themselves allowable for at least the same reasons discussed with respect to claim 1. In addition, reversal of the rejection is respectfully requested for at least the following reasons.

The Examiner's remarks in support of the rejection are as follows:

> Ebner et al disclose an oxygen scavenging element for a package, as disclosed above. The element comprises transition metal oxide (column 5, lines 47-55). With regard to Claim 17, Ebner et al fail to disclose a metal oxide comprising tungsten oxide. However, Ebner et al disclose the use of a transition metal oxide, as discussed above. It therefore would have been obvious for one of ordinary skill in the art, at the time Applicant’s invention was made, to have provided for tungsten oxide, as tungsten oxide is a transition metal oxide.
>
> With regard to Claims 30-33, Ebner et al fail to disclose a package comprising an item that is opto-electronic device, molecular device or a polymeric device. However, Ebner et al disclose a package, as discussed above. It therefore would have been obvious for one of ordinary skill in the art, at the time Applicant’s invention was made, to have provided for a

> package comprising any item, including an opto-electronic device, molecular device or a polymeric device.

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Claim 17

Claim 17 recites that the photo-activatable oxide semiconductor of claim 14 comprises WO_3.

For reasons consistent with the argument set forth above with respect to claim 16, tungsten is absent from the exclusive list of transition metals contemplated in Ebner. (Ebner, column 4, lines 46-57, reproduced above.) Also, the positive oxidation state of tungsten (WO_3) is not disclosed in Ebner among the inorganic transition metal salts suitable for use in the oxygen-scavenging combination. (Ebner, column 5, line 56 – column 6, line 9, reproduced above.)

Accordingly, it would not have been obvious for one of ordinary skill in the art to have modified the teachings of Ebner so as to use tungsten as a transition metal or WO_3 as a transition metal salt in the oxygen-scavenging combination.

Claims 30 and 31

Claim 30 recites that the item of claim 1 comprises an electronic device. Claim 31 recites that the item of claim 1 comprises an opto-electronic device.

By contrast, the moisture-activated oxygen-scavenging combination of Ebner is disclosed in the context of foodstuffs. As described above, enclosing the foodstuff into a container structure comprising the moisture-activated oxygen-scavenging combination provides the requisite amount of moisture to initiate oxygen scavenging. For example, Ebner recites:

> [O]nce a high degree of moisture is attained, as in a closed package environment of food products, the scavenging activity is initiated or triggered.

(column 8, lines 5-8.) Ebner also recites:

> Preferably, the oxygen scavenging reaction of the present composition is accelerated by pasteurizing (50°C-100°C.) or sterilizing (typically at 100°C-150°C.) the container after filling it with an aqueous fill and sealing it. This triggering appears to be a consequence of the subject composition, when heated, permitting moisture to permeate into the composition and contact the subject oxygen scavenger agent and its combination.

(column 10, lines 54-61.)

There is no rational basis for why one of ordinary skill in the art would use the moisture-activated oxygen-scavenging combination of Ebner in the context of a packaging for an electronic or opto-electronic device. Such combination requires the use of moisture, which would be detrimental to electronics and opto-electronics. Accordingly, it would not have been obvious for one of ordinary skill in the art to have modified the teachings of Ebner so as to use the moisture-activated oxygen-scavenging combination in the context of electronics or opto-electronics.

C. Rejection of claim 8 under 35 U.S.C. § 103(a)

Claim 8 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Ebner in view of Fisher. Claim 8 depends from claim 1, and, as such, are themselves allowable for at least the same reasons discussed with respect to claim 1. Additionally, Fisher does not overcome the deficiencies of Ebner as a teaching reference vis-à-vis the claimed subject matter, and accordingly the claims are allowable for this additional reason. Reversal of the rejection is also respectfully requested for at least the following reasons.

The Examiner's remarks in support of the rejection are as follows:

> Ebner et al disclose an oxygen scavenging element for a container comprising a polymer as discussed above. Ebner et al fail to disclose an element comprising a thiol.
>
> Fisher teaches a polymer comprising a polythiol for the purpose of obtaining a polymer that is corrosion resistant (column 1, lines 23-25). One of ordinary skill in the art would therefore have recognized the advantage of providing for the polythiol of Fisher in Ebner et al, which comprises a polymer, depending on the resistance of the end product.
>
> It therefore would have been obvious for one of ordinary skill in the art at the time Applicant's invention was made to have provided for a thiol in Ebner et al in order to obtain a polymer that is corrosion resistant as taught by Fisher.

Office Action dated June 24, 2009, page 5.

There is no rational basis for why one of ordinary skill in the art would modify the carrier of Ebner so as to comprise thiol, as disclosed in Fisher. The carrier compositions of Ebner are disclosed as being suitable for maintaining the agent free from moisture prior to use in the packaging environment, and permitting the ingress of oxygen and water into the carrier while in the packaging environment, thereby permitting oxygen scavenging to occur. (Ebner, column 7, lines 3-8; column 8, lines 25 and 26; column 8, lines 36-48.) Corrosion resistance aside, there is no teaching or suggestion in either Ebner or Fisher that the use of thiol in the carrier would maintain such functionality.

Moreover, as set forth with respect to claim 3, it is not taught or suggested that the carrier of Ebner functions as an electron donor in the oxygen-scavenging combination. Therefore, even if the carrier of Ebner was modified so as to include thiol, it would not function as an electron donor.

VIII. Conclusion

In view of the foregoing, it is respectfully submitted that the claims are patentable over the applied art and that the rejections advance by the Examiner should be reversed.

Respectfully submitted,

RENNER, OTTO, BOISSELLE & SKLAR, L.L.P.

/Don W. Bulson/

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Claims Appendix

1. A package packaging an item and defining a closed environment in which the item is enclosed, the packaging including an oxygen-scavenging element which includes a photo-activatable semiconductor and an electron donor, wherein the semiconductor, whilst exposed to ultra-bandgap light, generates electron-hole pairs, with the electrons acting to reduce oxygen, and thereby scavenge the same from the closed environment, and the holes combining with electrons sacrificed by the electron donor.

2. The package of claim 1, wherein the electron donor comprises an organic material.

3. The package of claim 2, wherein the organic material comprises a polymeric material.

4. The package of claim 3, wherein the polymeric material comprises PVA, PVC, PEG, polyethylene oxide, hydroxyethyl cellulose, or a mixture thereof.

5. The package of claim 2, wherein the organic material comprises an amine.

6. The package of claim 5, wherein the amine comprises EDTA, triethylamine, or a mixture thereof.

7. The package of claim 2, wherein the organic material comprises an alcohol.

8. The package of claim 2, wherein the organic material comprises a thiol.

9. The package of claim 2, wherein the organic material comprises an aldehyde.

10. The package of claim 1, wherein the electron donor comprises a liquid.

11. The package of claim 1, wherein the electron donor comprises a solid.

12. The package of claim 1, wherein the electron donor comprises a gas.

13. The package of claim 1, wherein the electron donor comprises a vapor.

14. The package of claim 1, wherein the semiconductor comprises an oxide semiconductor.

15. The package of claim 14, wherein the semiconductor comprises TiO_2.

16. The package of claim 14, wherein the semiconductor comprises ZnO.

17. The package of claim 14, wherein the semiconductor comprises WO_3.

18. The package of claim 14, wherein the semiconductor comprises at least two of TiO_2, ZnO and WO_3.

19. The package of claim 1, wherein the oxygen-scavenging element comprises a suspension containing the semiconductor.

20. The package of claim 1, wherein the oxygen-scavenging element comprises a paste containing the semiconductor.

21. The package of claim 1, wherein the oxygen-scavenging element comprises a gel containing the semiconductor.

22. The package of claim 1, wherein the oxygen-scavenging element

comprises a solid containing the semiconductor.

23. The package of claim 22, wherein the oxygen-scavenging element comprises a block containing an activatable semiconductor.

24. The package of claim 22, wherein the oxygen-scavenging element comprises a layer containing an activatable semiconductor.

25. The package of claim 22, wherein the oxygen-scavenging element comprises a powder containing an activatable semiconductor.

26. The package of claim 1, wherein the oxygen-scavenging element comprises an encapsulating layer encapsulating at least a surface of the item.

27. The package of claim 1, wherein the packaging comprises a film packaging defined at least in part by the oxygen-scavenging element.

28. The package of claim 1, wherein the packaging includes an open-topped container and the oxygen-scavenging element comprises a film which closes the container.

29. The package of claim 1, wherein the packaging includes a closed container and the oxygen-scavenging element is disposed within the container.

30. The package of claim 1, wherein the item comprises an electronic device.

31. The package of claim 1, wherein the item comprises an opto-electronic device.

32. The package of claim 1, wherein the item comprises a molecular device.

33. The package of claim 1, wherein the item comprises a polymeric device.

34. The package of claim 1, wherein the item comprises a foodstuff.

Evidence Appendix

None.

Related Proceedings Appendix

None.